

We claim:

1. An apparatus for forming an enlarged base on a yarn carrier comprising:
  - (a) a clamp for holding a paper yarn carrier having walls defining an inner surface and an outer surface with a terminal portion located at an end thereof;
  - (b) a die for being positioned around the outer surface of the yarn carrier defining the terminal portion, said die comprising an annular recess for receiving the terminal portion of the yarn carrier therein, the recess shaped and sized to correspond to a desired shape of the enlarged base; and
  - (c) molding means for inserting the terminal portion of the yarn carrier outwardly into the recess of said die and molding the enlarged base on the yarn carrier.
2. An apparatus according to claim 1, wherein prior to molding the yarn carrier the terminal portion of the yarn carrier is folded inwardly to form a rolled over portion on the inner surface, the rolled over portion initially defining an inner diameter and an outer diameter each no greater than a diameter of a remaining portion of the yarn carrier, and further wherein molding the terminal portion comprises enlarging the outer diameter of the rolled over portion to a diameter greater than the remaining portion of the yarn carrier and forming a reinforced enlarged base on the yarn carrier.
3. An apparatus according to claim 2, wherein molding the terminal portion comprises enlarging the inner diameter of the rolled over portion to a diameter greater than the remaining portion of the yarn carrier and forming the reinforced enlarged base on the yarn

carrier.

4. An apparatus according to claim 1, wherein said molding means comprises a plunger including a front end having a diameter less than the terminal portion of the yarn carrier and graduating to a rear end having a diameter greater than the terminal portion of the yarn carrier whereby said plunger frictionally engages the inner surface of the yarn carrier at the terminal portion as said plunger is inserted into the yarn carrier and urges the terminal portion outwardly into the recess of said die to mold the enlarged base on the yarn carrier.
5. An apparatus according to claim 4, wherein said plunger is rotatable for exerting force against the inner surface of the yarn carrier and creating friction heat facilitating the molding of the yarn carrier.
6. An apparatus according to claim 1, wherein said die comprises two arcuate die segments positioned in complimentary fashion around the outer surface proximate the terminal portion of the yarn carrier, said die segments movable in relation to the yarn carrier.
7. An apparatus according to claim 6, wherein each of said die segments are driven by an air cylinder.

8. An apparatus for forming an enlarged base on a yarn carrier comprising:
  - (a) a rotatable plunger for inserting into a first end of a hollow yarn carrier having walls defining an outer surface and inner surface, said plunger comprising a front end having a diameter less than the first end of the yarn carrier and graduating to a rear end having a diameter greater than the first end of the yarn carrier whereby said plunger frictionally engages the inner surface at a terminal portion of the yarn carrier;
  - (b) a die for being positioned around the outer surface proximate the first end of the yarn carrier, said die defining an annular recess for receiving the terminal portion of the yarn carrier therein, the recess shaped and sized to correspond to a desired shape of the enlarged base; and
  - (c) rotating means for rotating the yarn carrier and said rotatable plunger on a longitudinal axis whereby said plunger inserts the terminal portion of the yarn carrier into the recess of said die to mold the enlarged base on the yarn carrier.
9. An apparatus according to claim 8, wherein prior to molding the yarn carrier the terminal portion of the yarn carrier is folded inwardly on the inner surface to form a rolled over portion defining an inner diameter and an outer diameter each less than a diameter of a remaining portion of the yarn carrier, and further wherein molding the terminal portion comprises enlarging the outer diameter of the rolled over portion to a diameter greater than the remaining portion of the yarn carrier and forming a reinforced enlarged base on the yarn carrier.

10. An apparatus according to claim 8, wherein molding the terminal portion comprises enlarging the inner diameter of the rolled over portion to a diameter greater than the remaining portion of the yarn carrier and forming the reinforced enlarged base on the yarn carrier.

11. An apparatus according to claim 8, wherein said rotating means comprises a motor connected to said rotatable plunger for driving said plunger whereby said plunger rotates the yarn carrier.

12. An apparatus according to claim 8, wherein said rotating means comprises a motor connected to a rotatable mandrel for driving said mandrel, said mandrel for inserting into a second end of the yarn carrier whereby said mandrel rotates the yarn carrier and said plunger.

13. An apparatus according to claim 8, wherein said die comprises two arcuate die segments positioned in complimentary fashion around the outer surface proximate the first end of the yarn carrier, said die segments rotatable on an axis parallel to the longitudinal axis of the yarn carrier.

14. An apparatus according to claim 13, wherein said die segments are driven by an air cylinder and movable in relation to the yarn carrier.

15. A method for forming an enlarged base on a yarn carrier comprising the steps of:

- (a) providing a paper yarn carrier defining an inner surface and an outer surface on opposite sides thereof, and at least one end of said yarn carrier folded inwardly to form a rolled over portion on the inner surface at a terminal portion of the yarn carrier;
- (b) providing a chuck having a recess therein shaped to receive the terminal portion of the yarn carrier and extend the terminal portion of the yarn carrier outwardly upon rotating said chuck;
- (c) positioning the terminal portion of the yarn carrier into the recess of the chuck; and
- (d) rotating said chuck whereby the diameter of the terminal portion of the yarn carrier wall is extended outwardly and molded to form an enlarged base on the yarn carrier.

16. A method for making a yarn carrier according to claim 15, and further comprising the step of maintaining said yarn carrier in a stable position as said chuck rotates by frictionally engaging the yarn carrier with a clamp.

17. A method for making a yarn carrier according to claim 15, wherein the step of providing a paper yarn carrier comprises providing a frusto-conical or cylindrical paper yarn carrier defining an inner surface and an outer surface on opposite sides thereof, and at least one end of said yarn carrier folded inwardly to form a rolled over portion on the inner surface at a terminal portion of the yarn carrier.

18. A method for forming an enlarged base on a yarn carrier comprising the

steps of:

- (a) providing a paper yarn carrier defining an inner surface and an outer surface on opposite sides thereof, and at least one end of said yarn carrier folded inwardly to form a rolled over portion on the inner surface at a terminal portion of the yarn carrier;
- (b) positioning a die against the outer surface at the terminal portion of the yarn carrier, said die defining a recess for receiving the terminal portion of the yarn carrier, the recess shaped and sized to correspond to a desired shape and diameter of the enlarged base; and
- (c) positioning a molding mechanism within the yarn carrier at said terminal portion for inserting the terminal portion into the recess of said die to mold the enlarged base on the yarn carrier.

19. A method for making a yarn carrier according to claim 18, wherein the step of positioning a molding mechanism within the yarn carrier comprises inserting a plunger comprising a front end having a diameter less than the terminal portion of the yarn carrier and graduating to a rear end having a diameter greater than the terminal portion of the yarn carrier whereby said plunger frictionally engages the inner surface at the terminal portion and urges the terminal portion outwardly into the recess of said die to form the enlarged base on the yarn carrier.

20. A method for making a yarn carrier according to claim 18, wherein the step of positioning a molding mechanism within the yarn carrier comprises positioning a plunger

rotating on a longitudinal axis of the yarn carrier and comprising a front end having a diameter less than the terminal portion of the yarn carrier and graduating to a rear end having a diameter greater than the terminal portion of the yarn carrier whereby said rotating plunger frictionally engages the inner surface at the terminal portion and urges the terminal portion outwardly into the recess of said die to mold the enlarged base on the yarn carrier.

21. A method for making a yarn carrier according to claim 18, further comprising the step of supporting the yarn carrier in a stable position with a clamp.

22. A method for making a yarn carrier according to claim 18, wherein the step of providing a paper yarn carrier comprises providing a frusto-conical or cylindrical paper yarn carrier defining an inner surface and an outer surface on opposite sides thereof, and at least one end of said yarn carrier folded inwardly to form a rolled over portion on the inner surface at a terminal portion of the yarn carrier.

23. A method for forming an enlarged base on a yarn carrier comprising the steps of:

- (a) providing a paper yarn carrier defining an inner surface and an outer surface on opposite sides thereof, and at least one end of said yarn carrier folded inwardly to form a rolled over portion on the inner surface at a terminal portion of the yarn carrier;
- (b) positioning a die against the outer surface at the terminal portion of the yarn carrier, said die defining a recess for receiving the terminal portion of said

yarn carrier, the recess shaped and sized to correspond to a desired shape and diameter of the enlarged base;

- (c) providing a rotatable plunger within the yarn carrier at the terminal portion, said plunger comprising a front end having a diameter less than the terminal portion of the yarn carrier and graduating to a rear end having a diameter greater than the terminal portion of the yarn carrier whereby said plunger frictionally engages the inner surface at the terminal portion as said plunger is inserted into the yarn carrier; and
- (d) inserting said rotatable plunger into said yarn carrier, and rotating the yarn carrier yarn to urge the terminal portion outwardly into the recess of said die to mold the enlarged base on the yarn carrier.

24. A method according to claim 23, wherein the step of positioning a die against the outer surface at the terminal portion of the yarn carrier, comprises providing two arcuate complimentary die segments moveable in relation to the yarn carrier and pivotable on an axis parallel to a longitudinal axis of the yarn carrier, and positioning said die segments against the outer surface of the terminal portion.

25. A method according to claim 23, wherein the step of rotating the yarn carrier comprises rotating said plunger positioned within the yarn carrier.

26. A method according to claim 23, wherein the step of rotating the yarn carrier comprises positioning a rotatable mandrel within the yarn carrier at an end opposite to said plunger, and rotating said mandrel.

27. A method for making a yarn carrier according to claim 23, wherein the step of providing a paper yarn carrier comprises providing a frusto-conical or cylindrical paper yarn carrier defining an inner surface and an outer surface on opposite sides thereof, and at least one end of said carrier folded inwardly to form a rolled over portion on the inner surface at a terminal portion of the yarn carrier.

28. A yarn carrier having an enlarged base formed by a process comprising the steps of:

(a) providing a paper yarn carrier defining an inner surface and an outer surface on opposite sides thereof, and at least one end of said yarn carrier folded inwardly to form a rolled over portion on the inner surface at a terminal portion of the yarn carrier;

(b) providing a chuck having a recess therein shaped to receive the terminal portion of the yarn carrier and extend the terminal portion of the yarn carrier outwardly upon rotating said chuck;

(c) positioning the terminal portion of the yarn carrier into the recess of the chuck; and

(d) rotating said chuck whereby the diameter of the terminal portion of the yarn carrier wall is extended outwardly and molded to form an enlarged base on the yarn carrier.

29. A yarn carrier having an enlarged base formed by a process comprising the steps of:

(a) providing a paper yarn carrier defining an inner surface and

an outer surface on opposite sides thereof, and at least one end of said yarn carrier folded inwardly to form a rolled over portion on the inner surface at a terminal portion of the yarn carrier;

- (b) positioning a die against the outer surface at the terminal portion of the yarn carrier, said die defining a recess for receiving the terminal portion of the yarn carrier, the recess shaped and sized to correspond to a desired shape and diameter of the enlarged base; and
- (c) positioning a molding mechanism within the yarn carrier at said terminal portion for inserting the terminal portion into the recess of said die to mold the enlarged base on the yarn carrier.

30. A yarn carrier having an enlarged base formed by a process comprising the steps of:

- (a) providing a paper yarn carrier defining an inner surface and an outer surface on opposite sides thereof, and at least one end of said yarn carrier folded inwardly to form a rolled over portion on the inner surface at a terminal portion of the yarn carrier;
- (b) positioning a die against the outer surface at the terminal portion of the yarn carrier, said die defining a recess for receiving the terminal portion of said yarn carrier, the recess shaped and sized to correspond to a desired shape and diameter of the enlarged base;
- (c) providing a rotatable plunger within the yarn carrier at the terminal portion, said plunger comprising a front end having a diameter less than the terminal portion of the

yarn carrier and graduating to a rear end having a diameter greater than the terminal portion of the yarn carrier whereby said plunger frictionally engages the inner surface at the terminal portion as said plunger is inserted into the yarn carrier; and

(d) inserting said rotatable plunger into said yarn carrier, and rotating the yarn carrier yarn to urge the terminal portion outwardly into the recess of said die to mold the enlarged base on the yarn carrier.